

# Fermilab ILC R&D Goals

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7/8/05

Fermilab ILC R&D is focused on addressing the key ILC design and technical issues, cost reduction, and US industrial involvement in ILC. These efforts are aimed towards the development of the ILC Reference Design Report by the end of 2006 and the Technical Design Report that will follow.

The R&D goals are designed to establish the viability of all technical components, addressing the TRC criteria, as well as costs, and the engineering designs to enable “early” decision (by 2010). This will help position the US (and Fermilab) to host the ILC.

The main thrust of the Fermilab ILC R&D is to establish US technical capabilities in the Superconducting Radio Frequency Cavity and Cryomodule technology. The main goals described in detail in the proposal are:

1. Cavity technology development in the US to routinely achieve  $\geq 35$  MV/m and  $Q \sim 0.5-1E10$
2. ILC Cryomodule design and fabrication
3. Fully tested basic building blocks of the Main Linac with beam
4. Accelerator design issues in the Main Linac, Damping Ring and Machine Detector Interface
5. Development of an ILC site near Fermilab.

While focused on the long term goals for ILC design and construction, Fermilab, in the near term, will also work with the GDE in development of the Baseline Configuration Document and the Reference Design Report, taking responsibilities for the chapters on Main Linac and US Site, by the end of FY06.

## Reference Design Report (RDR)

Fermilab is proposing to take the responsibilities of writing the following two chapters

- Main Linac
- US ILC Site near Fermilab

Fermilab will also help in the accelerator physics and design of Damping Ring and Machine Detector Interface. Fermilab will participate in overall RDR including cost, schedule, availability and risk analysis.

## US-ILC Site Development

Fermilab and SLAC Civil engineering groups are collaborating on development of a site analysis matrix to compare different sites. At present we are looking at 5 potential sites. Fermilab will also coordinate these studies with similar studies in Asia and Europe.

There are several issues from accelerator design that needs to be taken into consideration in these site studies

- 1 tunnel vs 2 tunnels
- Deep or shallow layout
- Laser straight linac, follow the earth curvature, laser straight in segments

Phase 1 and Phase 2 of 1.3 GHz cavity production:

Phase 1: In FY05, we have placed an order with industry to fabricate 8 (4 produced in US) 9-cell cavities. These cavities will be processed (BCP and EP) using the facilities at Cornell and Jlab. This phase will be used to develop the processing parameters.

Phase 2: In FY06, we plan to place an order to fabricate in US industries up to 24 cavities. These cavities are planned to be processed at the BCP and EP facilities proposed to be developed at ANL/FNAL. This phase will be used to perfect the cavity production and processing technologies.

### FY06 Goals (Full Proposal)

- Reference Design Report and Accelerator Physics
- Upgrade infrastructures at Cornell (BCP) and Jlab (EP) to process cavities produced in 1<sup>st</sup> phase.
- Develop BCP and EP processing parameters to achieve 35 MV/m using Cornell and Jlab facilities.
- Develop infrastructure to assemble cavity strings and cryomodules at Fermilab
- First US assembled cryomodule Type III+ using BCP and EP cavities from Cornell and Jlab processing.
- Fermilab site development
- Commission the FNAL/ANL BCP facility to process cavities produced in 2<sup>nd</sup> Phase.
- Commission the Single Cavity Horizontal Test Stand at Fermilab.
- 25 MV/m cavities fabricated and Tested (Vertical/Horizontal) in USA with BCP at FNAL/ANL.
- Develop infrastructure for EP at FNAL/ANL
- Design and construction of a Single Cavity Vertical Test Stand at Fermilab
- Design and initial fabrication parts for an ILC Cryomodule (4<sup>th</sup> generation)
- Develop High Power Test Facility Infrastructure to cool down, power and test with beam 1<sup>st</sup> US assembled Cryomodule

## FY06 Goals (\$16M Proposal)

- Reference Design Report and Accelerator Physics
- Upgrade infrastructures at Cornell (BCP) and Jlab (EP) to process cavities produced in 1<sup>st</sup> phase.
- Develop BCP and EP processing parameters to achieve 35 MV/m using Cornell and Jlab facilities.
- Develop infrastructure to assemble cavity strings and cryomodules at Fermilab
- First US assembled cryomodule Type III+ using BCP and EP cavities from Cornell and Jlab processing.
- Fermilab site development
- Commission the FNAL/ANL BCP facility to process cavities produced in 2<sup>nd</sup> Phase.
- Commission the Single Cavity Horizontal Test Stand at Fermilab.
- Design of the Vertical Test at Fermilab.
- 25 MV/m cavities fabricated and Tested (Horizontal at FNAL) in USA with BCP at FNAL/ANL.
- Complete Design of and begin construction of EP Facility at FNAL/ANL.
- Design and start construction of a Single Cavity Vertical Test Stand at Fermilab
- Design of an ILC Cryomodule

## FY06 Goals (\$13M Proposal)

- Reference Design Report and Accelerator Physics
- Upgrade infrastructures at Cornell (BCP) and Jlab (EP) to process cavities produced in 1<sup>st</sup> phase.
- Develop BCP and EP processing parameters to achieve 35 MV/m using Cornell and Jlab facilities.
- Develop infrastructure to assemble cavity string and cryomodule
- First US assembled cryomodule Type III+ using BCP and EP cavities from Cornell and Jlab processing.
- Fermilab site development
- Commission the FNAL/ANL BCP facility to process cavities produced in 2<sup>nd</sup> Phase.
- Commission the Single Cavity Horizontal Test Stand at Fermilab.
- Limited studies of cavities fabricated and Tested (Horizontal at FNAL) in USA with BCP at FNAL/ANL to achieve 25 MV/m.
- Design study for an EP Facility at FNAL/ANL.
- Limited design of an ILC Cryomodule

## FY06 Goals (\$10M Proposal)

- Reference Design Report and Accelerator Physics
- Upgrade infrastructures at Cornell (BCP) and Jlab (EP) to process cavities produced in 1<sup>st</sup> phase.

- Develop BCP and EP processing parameters to achieve 35 MV/m using Cornell and Jlab facilities.
- Develop infrastructure to assemble cavity strings and cryomodules at Fermilab
- First US assembled cryomodule Type III+ using BCP and EP cavities from Cornell and Jlab processing.
- Fermilab site development
- Commission the FNAL/ANL BCP facility (no processing)
- Commission the Single Cavity Horizontal Test Stand at Fermilab.